AIR BUBBLE MASSAGE BATHTUB MAT SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an air bubble massage bathtub mat system.

2. Background Art

Bath massage systems have been developed that include a mat placed in a bathtub through which compressed air is directed. Compressed air is provided by an air pump. The compressed air is emitted from the mat in the form of bubbles for massaging a bather.

One example of a prior art mat for bubbling compressed air through bath water is disclosed in U.S. Patent No. 3,809,073 that is provided with an electronic control on the housing of the pump unit. The housing includes an insulating cover that prevents a bather from touching the electronic controls without first opening the cover to switch off the electric current.

Another example of a bubbling air mat is disclosed in U.S. Patent No. 4,962,759 that discloses a rope heating element for warming the air stream that is directed through an air hose to the bubbling air mat.

U.S. Patent No. 5,090,403 discloses an air bubble mat that is formed from two foils placed on top of one another between which air feed ducts or air chambers are defined.

There is a need for an air bubble massage bathtub mat system that offers a convenient way to control operation of the system. In particular there is a need for remote control to minimize any potential shock hazard and eliminate the

need for a bather to exit the bathtub to operate an alternating current powered pump control. It would also be desirable to eliminate any need to attempt to manually contact the pump control while remaining in the bathtub. The remote control should be capable of controlling the heat of the air injected, time of operation, and level of air output. It would also be desirable to provide for the selection of a programmable massage cycle that may be controlled by the remote control.

There is also a need for an air bubble massage bathtub mat that is simply constructed and durable for long product life. It would also be desirable to provide a air bubble massage bathtub mat that is designed to assure adequate air distribution for substantially uniform bubbling action. Another desirable feature would be to provide a bathtub mat that remains in position in the bathtub and may be attached and detached without modification of the bathtub surface. It would also be desirable to provide an air bubble massage bathtub mat made of thermoplastic sheet material that is flexible and may be rolled up for compact storage. A bathtub system is needed that also provides for convenient storage of all components parts.

This invention addresses the above noted problems and fulfills the above needs as summarized below.

SUMMARY OF THE INVENTION

According to one aspect of the present invention an air bubble massage bathtub mat system is provided that may have a remote control. The system includes an air pump that provides a source of compressed air to a mat having at least one air passage and a plurality of air outlet holes. A hose connects the air pump to the air passage in the mat and a controller is provided for controlling operation of the air pump. A remote control unit is provided that communicates by an infrared digital signal with the controller.

The system has a housing for an air pump and heater that also includes a control panel having a plurality of switches for controlling the air pump and heater. The heater uses a heating element downstream of the air pump but

within the housing to heat the compressed air. The remote control unit has switches for controlling generally the same functions as the control panel. The controller and remote control unit both, if desired, may have switches for controlling predetermined massage program cycles. The massage program cycles may be varied to provide massage cycles of different durations. The massage programs may vary the air pump speed according to a predetermined cycle with gradual or immediate changes in strength of bubbling action. The massage cycle may also vary the speed of the massage cycle changes.

According to another aspect of the invention, the system provides for convenient storage of component parts. The mat is formed of a flexible material, such as a soft vinyl, that may be rolled up for storage. A recess may also be formed on the housing of the air pump for storing the remote control unit. A bracket may also be provided for the remote control unit that is adapted to be secured to a supporting surface spaced from the housing but preferably within the easy reach of a bather using the air bubble massage bathtub mat system.

According to another aspect of the invention, an air bubble massage bathtub mat is provided for an air bubble massage system that provides compressed air to the mat when the mat is disposed in the bathtub. The mat includes a flexible member having at least two layers defining a plurality of air passages. The mat includes a receptacle through which compressed air is provided to the air passages. A plurality of air holes are formed in the air passages through which compressed air is emitted from the air passages into the bathtub. A plurality of flexible blocks are secured to or within the flexible member at spaced locations adjacent the air passages.

The flexible member of the air bubble massage system may be formed of at least two layers of polymer sheet material that are secured together at spaced locations to define the air passages. The flexible blocks may be retained between two layers of polymer sheet material in separate areas from the air passages. The polymer sheet material may be polyethylene, a soft vinyl such as polyvinyl chloride, or another flexible thermoplastic sheet material.

A plurality of suction cups are secured to the bottom of the flexible member to provide a detachable connection to the bathtub. The suction cups may be secured in groups to a segment of the same type of polymer used to make the bath mat. Alternatively, a composite material may be used for the suction cups, wherein a polymeric material forms an upper part of each cup secured to the flexible member and a rubber material forms a lower part of each cup for contacting the bathtub and providing the detachable connection.

According to another aspect of the invention the air holes in the air passages are limited in size and in number to provide a flow restriction that causes the air passages to be inflated when compressed air is provided to the air passages.

According to yet another aspect of the invention each of the flexible blocks are enclosed in a sealed chamber formed of the polymer sheet material having seams that define the air passages and the sealed chambers. The air passages and sealed chambers are separate from each other. The two layers of thermoplastic sheet material may be bonded together about the periphery of the flexible blocks to hold the blocks in place. The layers of thermoplastic sheet material also define air passages that form of a branched array.

Additional features and aspects of the invention will be better understood in view of the attached drawings and detailed description of the invention that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of an air bubble massage bathtub mat system.

FIGURE 2 is a cross sectional view of the air bubble massage bathtub mat taken along the line 2-2 in Figure 1.

FIGURE 3 is a cross sectional view of the air bubble massage bathtub mat taken along the line 3-3 in Figure 1.

FIGURE 4 is a perspective view of the blower/air heater unit for the air bubble massage bathtub mat system.

FIGURE 5 is a perspective view of a remote control unit for use with the blower/air heater unit.

FIGURE 6 is a perspective view of the blower/air heater unit partially disassembled.

FIGURE 7 is an electrical schematic for the isolation power supply for a control panel of the blower/air heater unit.

FIGURE 8 is an electrical schematic diagram of the blower/air heater controller.

FIGURE 9 is an electrical schematic diagram showing an alternative embodiment of a blower/air heater unit.

FIGURE 10 is a block diagram of the component parts of the remote control unit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to Figure 1, an air bubble massage bathtub mat system 10 is shown. The system 10 includes a mat 12 and blower/air heater unit 14. The mat 12 is connected to the blower/air heater unit 14 by a hose 16 that directs compressed air from the blower/air heater unit 14 into the mat 12. A remote control unit 18 is provided to permit a bather to remotely control the blower/air heater unit 14.

As shown in Figure 6, an air pump 20 and heating element 22 are disposed in the housing 26 of the blower/air heater unit 14. The housing 26 includes a receptacle 28 for the hose 16. A check valve 30 is preferably incorporated as part of the receptacle 28 to prevent water from flowing through the hose 16 into the power unit 14. A control panel 32 is provided on the housing 26 for controlling various functions of the blower/air heater unit 14 without using the remote control unit 18.

Referring now to Figures 1, 2 and 3 the mat 12 will be described in greater detail. The mat 12 includes a plurality of flexible blocks 36 that are secured to or retained within the mat 12. Air passages 38 are defined by the mat 12. Air passages 38 conduct air from the hose 16 to a plurality of holes 40 through which air is permitted to escape into a bath to provide the massaging action of the air bubble massage bathtub mat system 10. The mat 12 is preferably formed by top and bottom sheets of soft vinyl material, such as polyvinyl chloride, or another thermoplastic polymeric material 42, 44 that are bonded together about their periphery and are also bonded at intermediate locations to locate or affix the flexible blocks 36 and also to form the air passages 38. The sheets of polymeric material 42, 44 are preferably bonded together by heat or ultrasonic welding but could also be chemically bonded.

The mat 12 includes a receptacle 46 for receiving a hose end 48 at one end of the mat 12. The mat 12 is secured to a bathtub by means of suction cups 50 that are affixed to the bottom of the mat 12. A plurality of suction cups 50 are secured to strips 52 that are formed of the same thermoplastic polymer used to make the mat 12. The strips 52 permit the suction cups 50 to be secured in groups to the bottom surface of the mat 12. Alternatively, suction cups 50 could be formed from a composite material including a polymeric material adapted to be secured to strips 52 and a rubber material adapted to contact the bathtub and provide the detachable connection thereto. A hose holder 54 is provided to temporarily secure the hose 16 to the bathtub preferably by means of a suction cup.

Referring now to Figure 4, the control panel 32 of the blower/air heater unit 14 is shown to include a power switch 56 for turning the power unit on and off. A heat switch 58 is provided for turning on and off or setting the level of heat to be imparted to the compressed air flow by the heating element 22 contained in the blower/air heater unit 14. A timer switch 60 is provided to permit a user to set the duration of operation of the power unit. A speed switch 62 is provided to control the speed at which programmed massage cycles progress. A strength switch 64 controls the speed of operation of the air pump 20 that controls the strength of the bubbling action. A massage switch 66 is provided to control the massage level. A program switch 68 permits a user to program the blower/air heater unit 14 to operate on a predetermined cycle that provides programmed changes of massage cycles to be automatically generated.

Referring now to Figure 5, the remote control unit 18 is shown in greater detail. The function buttons on the remote control unit 18 generally correspond to the switches on the control panel 32 of the blower/air heater unit 14. The remote control unit 18 includes a remote power switch 70, a remote heat switch 72, a remote timer switch 74, a remote speed switch 76, a remote strength switch 78, a remote massage switch 80 and a remote program switch 82. The remote control unit 18 also includes an infrared light transmitter 84. The remote control unit 18 should be pointed towards the blower/air heater unit 14 so that infrared light emitted by the infrared light transmitter 82 is received by an infrared light receiver 86 on the blower/air heater unit 14. Alternatively, a radio frequency link could be used instead of the infrared link.

The control panel 32 includes a plurality of diodes 88 or other indicator lights, that indicate the status of the blower/air heater unit 14. When the switches on the control panel 32 or the remote switches on the remote control unit 18 are actuated the diodes 88 are illuminated to indicate the status of the blower/air heater unit 14.

Referring now to Figure 7, an isolation power supply 100 is shown through which power is provided to the blower/air heater unit 14 control panel 32.

The isolation power supply 100 is of the Class II type and it is used to isolate the user from primary voltage at the control panel. Other power supplies could also be used.

Referring now to Figure 8, a schematic electrical diagram for the blower/air heater unit 14 is shown. A power supply 102 is controlled by power switch 104. A microprocessor 106 that may be a programmable integrated circuit is programmed to control the operation of the blower/air heater unit 14 in accordance with user controlled and preprogrammed inputs. A clock circuit 108 provides timing for the microprocessor 106.

A control switch and LED grid is generally referred to by reference numeral 110. The microprocessor has a speed input 112, a strength input (blower speed) 114, a duration input 116 and a massage program/manual input 118. Each of the inputs 112-118 are provided to the microprocessor 106 on separate pins of the microprocessor. The heat switch 58, timer switch 60, speed switch 62, strength switch 64, massage switch 66 and program switch 68 are incorporated in the control switch and LED grid 110 and are connected to the input lines 112-118. In the embodiment illustrated in Figure 8, three different programs are provided with each program having indicator lights provided by first, second and third programmed LED sets 122, 124 and 126. For example, first program set may include a timing setting of 60 minutes, a high strength setting and a high speed setting. Second program may include a time of 30 minutes, a strength of medium and a speed of medium. The third program set may, for example, have a duration of 15 minutes with a low strength setting and a low speed setting. If it is desired to operate the system on a manual basis the manual operation may be indicated by a general LED set 128. If desired, a different number of programs having different operational characteristics can be provided.

The microprocessor is used to control the outputs of the system including a heater control 132 that controls the heating element 22. Heating element 22 is connected to an alternating current tap at 134. A motor speed control 136 is also controlled by the microprocessor to control operation of the air pump 20. The

air pump 20 is also connected to the alternating current tap at 134. The microprocessor 106 may also control a timer/buzzer control 138 that may be set to alert a bather to a time limit.

The microprocessor is also provided with a digital input from a receiver microprocessor 140. The receiver microprocessor receives a digital bit stream that is transmitted via infrared light from the remote control unit 18. The function and operation of the remote control unit 18 is described below with reference to Figure 10.

Referring now to Figure 9, an alternative embodiment of a power circuit for the blower/air heater unit 14 is shown that has a simplified control and fewer programmable functions. The circuit 150 includes an alternating current power supply 152 that is connected through a fuse 154 to the main power switch 156 of the circuit. A heater on/off control 158 is indicated by an on/off LED 160. The status of the heating element 22 is indicated by a heater LED 162. The air pump or blower speed control is generally indicated by reference numeral 164. A potentiometer 166 controls a gating circuit generally indicated by reference numeral 168 that includes a diac 170 and triac 172 that cooperate to control the speed of operation of the air pump 164. Potentiometer 166 provides blower speed control by adjusting the gating current through diac 170. The output of diac 170 gates triac 172 to vary the speed of operation of the air pump 20.

Referring now to Figure 10, a remote control transmitter circuit is generally indicated by reference numeral 180. Remote control transmitter circuit 180 includes control switches 182 that correspond to switches 70-82 as previously described. The control switches 182 control microprocessor 184 that generates a digital bit stream that is transmitted by an infrared transmitter 186 from the remote control unit 18 by infrared light transmission to an infrared receiver 140 that is located on the control panel 32 of the blower/air heater unit 14.

While embodiments of the invention have been illustrated and described, it is not intended that these embodiments illustrate and describe all

possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention.